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1558

In Search of Price Rigidities

(Recent Sector Evidence from Argentina)

Monetary and exchange rate policies have different effects on relative prices among economic sectors — and thus significantly influence the real side of the economy.

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Summary findings

The hypothesis that the price adjustment to nominal shocks is instantaneous has been part of the monetarist approach explaining the inflationary process in Argentina.

But Morisset and Revoredo argue that monetary and exchange rate policies have had different effects on relative prices and thus have a significant influence on the real side of the economy. The existence of rigidities has prevented full and instantaneous price adjustments.

Recent work on inflation in imperfectly competitive markets explains rigidities as a consequence of firms' strategic responses to nominal shocks, which in turn depend on the market structure and demand elasticities faced by firms.

Price rigidities emerge when firms facing changes in aggregate demand behave collusively, and there are costs for customers to switch between suppliers. The higher the collusive behavior, the higher the possibility for these firms to maintain or eventually increase their prices during recession. In contrast, when the costs for customers to switch between suppliers are low, firms are obliged to adjust their prices to new demand conditions, otherwise they will lose their customers.

Changes in foreign prices affect domestic prices depending on the degree of foreign competition and the price formation mechanism in each sector. As expected, price rigidities are minimal in tradable sectors where firms react to these changes by changing their prices almost instantaneously (although not one-for-one). The response in nontradable activities depends on indirect effects and whether prices are indexed to a foreign currency, likely when transactions are conducted in a foreign currency.

Because understanding this is essential for effective policymaking, Morisset and Revoredo analyze price behavior of four economic sectors — agriculture, industry, (retail) commerce, and services — in Argentina from 1981–94. (The two nontradable sectors account for most GDP and employment in Argentina.)

The econometric analysis shows large differences in the price behavior across sectors. Firms do not respond uniformly to changes in production costs, foreign prices, and demand conditions.

The conclusions have obvious policy implications. The response of individual prices reflects the distribution of adjustment costs across sectors in the case of nominal shocks. This is most evident when, facing a recession, some sectors are able to maintain their margins through collusive behavior, while others have to reduce them to retain their customers. To maintain social and political stability, the government's challenge is to minimize divergence across sectors. Increasing competition appears to be a crucial element of this strategy since monopolistic power is frequently associated with the existence of price rigidities.

This paper — a product of the Country Operations Division, Country Department I, Latin America and the Caribbean — is part of a larger effort in the department to understand goods and services market behavior in developing countries. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Nancy Cuellar, room Q7-116, telephone 202-473-7892, fax 202-522-3131, Internet address ncuellar@worldbank.org. December 1995. (26 pages)

IN SEARCH OF PRICE RIGIDITIES:
Recent Sectoral Evidence from Argentina [1]

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[1] We are grateful to A. Estache and A. Izquierdo for their helpful comments and suggestions.

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Introduction

> *"Even if the ultimate effects of monetary changes on different prices were to be, at long last, uniform, this would still be less important for many purposes than the initial variability. [...] The fact that monetary changes do not affect all prices in the same way, in the same degree, or at the same time, is what makes them significant. It is the divergence between the movements of different price levels which are at once the test and the measure of the social disturbances which are occurring."* J. M. Keynes. "A Treatise on Money: The Pure Theory of Money," pp.83-84.

Traditionally, the monetarist approach in which all prices adjust instantaneously to nominal shocks has been used to explain the inflationary process in Argentina. Indeed, the variations in the price level have generally been the consequence of frequent changes in monetary and exchange rate policies. Still, this paper argues that these policies have had differentiated effects on relative prices and, thus, have influenced significantly the real side of the economy. The existence of rigidities has prevented full and instantaneous price adjustments.

The existence and effects of rigidities in an economy can be understood in the light of recent work on inflation in imperfectly competitive markets (see Blanchard and Fischer (1989) for a survey). The main lesson is that the response of firms to nominal shocks is based on strategic considerations, which in turn depend on the market structure and demand elasticities. This mechanism must be clearly identified to be used for policy. That is what we do here, by examining the inflation behavior of four economic sectors in Argentina over the period 1981-1994; *agriculture, industry, (retail) commerce, and services*. The case of Argentina is particularly interesting because it offers a unique combination of large nominal shocks and disproportionate variations in the inflation rate over the past decades. Furthermore, unlike most existing empirical studies dealing with this issue, the analysis will not be restricted to industrial products. The inclusion of retail commerce and services will allow us to analyze the price behavior of the non-tradable sector, which accounts for the major share of GDP and employment in Argentina.

This approach has obvious policy implications. We subscribe to the view that the most important aspect of inflation consists in its asymmetric effects on economic sectors. Traditionally, this aspect has been examined by emphasizing the costs and benefits of inflation on income distribution, with the wealthiest being able to protect themselves by using indexed financial instruments and strong wage bargaining power (see Khan and Morisset (1993)) In this paper, an alternative approach is taken that stresses the heterogeneous effects of (homogenous) nominal shocks on the prices of economic sectors. Large and unexpected divergences would have important real effects on the allocation mechanisms, which ultimately would affect social stability and the willingness of different groups to adhere to the existing social contract.

The paper proceeds as follows. In the first section, we briefly review the principal explanations advanced in the recent literature to explain price rigidities, emphasizing their merits and limitations. We also present evidence on price rigidities in Argentina over the last decade. In the second section, we turn to the question of which variables influence the price behavior in Argentina. Because these variables and, above all, the magnitude of their effects on the inflation rate are likely to differ across sectors, the analysis is done at a sectoral level by distinguishing four main economic sectors. In the third part, we try to put the pieces together by summarizing the implications of a change in economic activity or/and foreign prices on the adjustment of prices in each economic sector in Argentina. The last section contains our principal conclusions as well as policy recommendations.

1. Nominal Shocks and Relative Prices Variability in Argentina: Some Evidence

In the Keynesian tradition, nominal shocks such as changes in monetary and exchange rate polices are not expected to be neutral on the structure of relative prices because of the existence of rigidities. This issue is well known and several arguments coexist in the literature. First, price rigidities emerge when there are (menu) costs of changing prices such as fixed-term contracts or uncertainty created by asymetric

information. Under these conditions, some price-setters may decide not to adjust their prices in response to small nominal shocks (see Blanchard and Fischer (1989) or Andersen (1993) for a summary). Second, the differentiated response of individual firms to nominal shocks may also be caused by the availability of external funds. Liquidity-constrained firms may be forced to increase their prices more rapidly than others in periods of recession (or high interest rates) in order to raise internal funds (Chevalier and Sharfstein (1995)).

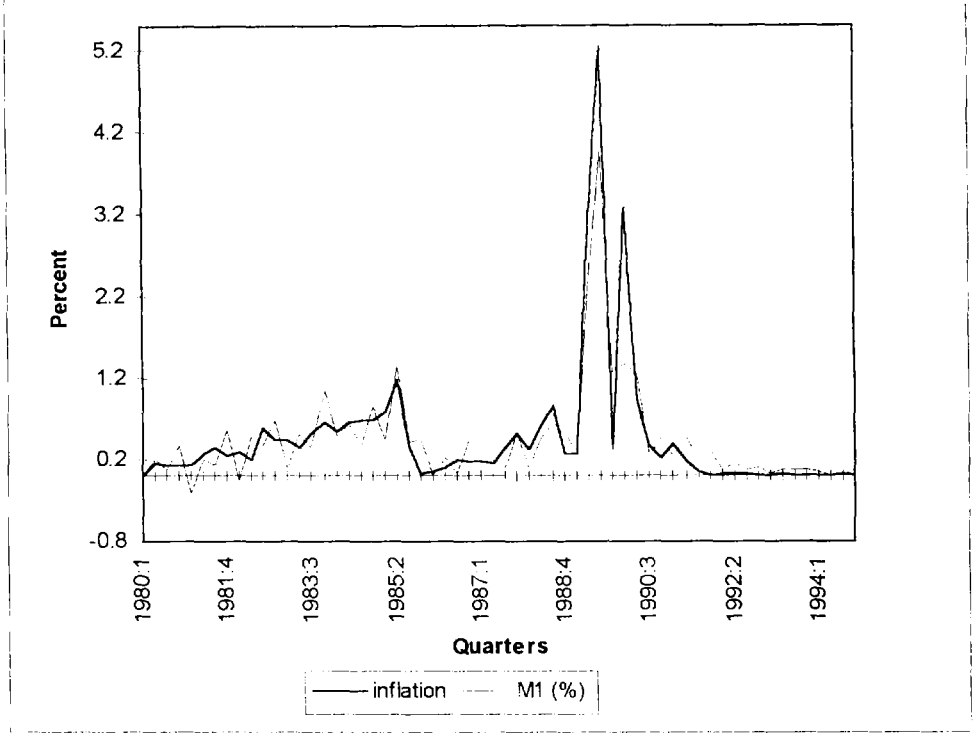
Others popular arguments are that price rigidities are created by the existence of inventories (Blinder (1982)), the attachment of customers to their supplier because it is costly to shift between suppliers (e.g. the cost of research), or the collusion between firms in oligopolistic markets (Rotemberg and Woodford (1991). It also generally takes time for consumers and suppliers to react to a nominal shock or to realize that a shock occurred. Another related explanation is that prices are more rigid downwards than upwards, leading to dramatic changes in the structure of relative prices. This explanation, the so-called "kinked demand curve" has a long history in the industrial organization literature and has been applied to a macroeconomic context extensively (see Stiglitz (1984)).

Finally, even if the initial monetary disequilibrium, for example, is eliminated by allowing an increase in prices so as to bring money in real terms back to its initial level, the transfer of wealth that will have taken place during the adjustment process will affect the relative price adjustment. As emphasized by Keynes (1930), this transfer will depend on the differential effect of the price movement on cash holders, on owners of fixed interest paper and on creditors, compared with on debtors.

The existence of rigidities can be illustrated by the effect of nominal shocks on the structure of relative prices in Argentina over the last decade. The case of Argentina is attractive because the inflationary process in this country has been traditionally explained by the frequent changes in monetary and exchange rate policies (see Dornbusch and de Pablo (1988) among others). The close association between the growth in monetary aggregates and the inflation rate is depicted in Figure 1, and the role of the exchange rate is best evidenced by the adoption of a fixed rate in March 1991 --the so-called Convertibility Law-- that produced a virtually unprecedented

reduction in the inflation rate from about 30 % monthly in early 1991 to international levels in mid-1993.[2] Therefore, price variability across sectors, if any, can be certainly interpreted as the result of nominal shocks rather than (real) supply shocks.

Figure 1: Inflation and M1, 1980-94



There exists substantial empirical evidence that nominal shocks have not been neutral with respect to the structure of relative prices in Argentina. Perhaps the best indicator is that the (quarterly) general consumer price inflation rate averaged about 33 % between 1981 and 1994, but ranged from only 28 % in industry to over 50 % in retail

[2] There is no strong empirical evidence, however, that variations in inflation were associated with movements in monetary aggregates or the exchange rate during periods of moderate and low inflation such as the Convertibility Plan. For example, the exchange rate was fixed during this period, and the contemporaneous correlation between the inflation rate and M1 only averaged 0.35 between the third quarter of 1991 and the fourth quarter of 1994 (versus over 0.90 for the period 1980-94).

commerce. Similar differences can be depicted in shorter periods, such as the Convertibility Plan. Table 1 reports that the variability of the CPI inflation rate across economic sectors averaged 410 % during the period 1981-94, with the highest peak in the 1986-91 years. [3] Interestingly, as in Blejer (1983), the average level of inflation appears to be related positively to the variability of relative prices

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Table 1: Price Variability in Argentina: 1981-94 a/
In %

Period	Inflation Rate b/	Variability c/
1981.1-1994.1	33.2	410.7
1980.2-1985.2	44.4	244.3
1985.3-1986.2 d/	8.5	71.5
1986.3-1991.1	47.5	879.8
1991.2-1994.1 e/	1.9	30.7

Notes:
a/ Based on 9 economic sectors: agriculture, industry, commerce services, transports, construction, hotels, electricity, and mines.
b/ Simple arithmetic average
c/ see footnote 3
d/ So-called Austral Plan
e/ So-called Convertibility Plan

In spite of the above evidence, the effect of nominal shocks on relative prices has been widely ignored in Argentina. [4] Most authors have assumed that these shocks have no real effect on the real economy. Nevertheless, the above evidence suggests

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[3] The variability of relative prices is calculated as follows: $VR = \Sigma\, w_i(\Delta p_{it} - \Delta p_t)^2$ where Δp_{it} is the inflation rate of sector i, Δp_t is the average inflation rate, and w_i the share of i in the average inflation rate. VR increases monotically with the differences between individual price movements, and its lower bound is zero, when all the prices change proportionally.

[4] The exceptions are Blejer (1983), and R. Frenkel in many papers.

that further attention must be devoted to this aspect of the inflationary process in Argentina. That is what we do in the next section.

2. Price Behavior Across Economic Sectors: An Econometric Analysis

We now turn to the question of why price-setters have had heterogeneous responses to homogenous nominal shocks in a country like Argentina. Although there exist multiple causes for the variations in relative prices --as described earlier--, many of them are brought about because of the existence of some degree of imperfect competition. Microeconomists have long recognized that sticky prices and perfect competition are incompatible, because in a competitive market, a firm does not set its price, but accepts the price quoted by the Walrasian auctioneer. The existence of monopolistic power seems to be compatible with the empirical evidence in many goods and service markets in Argentina as discussed further in the text.

Using the approach defined by Blanchard and Muet (1993), the inflation behavior is based on an error correction mechanism. The short-term dynamics are partially determined by the response of price setters to changes in costs, foreign prices, and demand conditions and partially by the error correction mechanism itself. That is, if actual prices are above both unit costs and foreign prices, we expect inflation to fall in the next period, which brings prices closer to cost and foreign prices.[5] Also, the model assumes the existence of nominal rigidities --lags in the adjustment of prices to wages --and real rigidities such as lags in the response of wages and prices to demand conditions. This is consistent with the idea that rigidities prevent full and instantaneous price adjustments in Argentina.

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[5] The error component specification captures the idea that agents alter their behavior according to "signals" that they are out of equilibrium. It can be justified theoretically (within finite or infinite horizon) by quadratic costs of adjustment framework (see Hendry and Von Ungern-Sternberg 1981).

Equation 1

$$\Delta p_{it} = \alpha_0 + \alpha_1 \Delta c_{it} + \alpha_2 \Delta p^*_t + \alpha_3 \Delta x_{it} + \alpha_4 \Delta y_{it} - \alpha_5 [p_{it-1} - \beta c_{it-1} - (1-\beta) p^*]_{t-1}$$

$$with\ \alpha_1, \alpha_2, \alpha_5\ and\ \beta \geq 0;\ \alpha_3, \alpha_4 \succ or \prec 0$$

where p_{it} is the price of goods/services in sector i a time t, c_i unit cost, p^*_t the domestic price of foreign goods, y_{it} current excess demand and x_{it} the expected value of future excess demand. All variables are expressed in logarithms (with Δ equivalent to percentage change).

It is worth underscoring that the changes in monetary policy are captured by the excess demand in the goods/services market rather than the variations in monetary aggregates because the latter cannot be discriminated by economic sectors. Such a discrimination is important because an exogenous variation in money is unlikely to spread evenly and proportionally over all economic sectors. Moreover, differences are likely to emerge between variations in current and future excess demand as argued by Benabou (1992) and Rotemberg and Woodford (1991). According to these authors, the signs of the coefficients associated with the current excess demand (α_3) and with the expected value of future demand (α_4) depend on the market structure: customer market versus collusive market. Although their arguments have been presented elsewhere[6], their basic contents are briefly summarized below.

- The *customer market* theory predicts that temporarily high current demand leads firms to raise prices without fear of customer loss, while the expectation of high future demand leads them to compete harder now, to attract a clientele that can be profitably exploited later.[7] Hence inflation should increase with current excess demand ($\alpha_3 > 0$) and decline with the expected value of future excess demand ($\alpha_4 < 0$).

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[6] See Rotemberg and Woodford (1991), Blanchard and Fischer (1989) or Andersen (1993).

[7] Put broadly, lower prices are a form of investment in market share, assuming that the demand is relatively elastic and that the capacity constraint will not prevent any further (short-term) increase in production.

- Alternatively, the *collusive market* theory predicts that when current demand is high relative to future demand, the incentive for any firm to cut its price rises because it becomes more valuable to capture current sales than to maintain collusion in the future. The inflation rates should now decrease ($\alpha_3 < 0$) in the short-run with current excess demand but increase in the longer-run ($\alpha_4 > 0$) as captured by the expected value of future excess demand.

In the longer-run, the price behavior is determined as a dynamic equilibrium (if all nominal variables are growing at the same rate and there is an equilibrium on the good market):[8]

Equation 2

$$p_{it} - c_{it} = \left(\frac{1-\beta}{\beta}\right)(p^*_{it} - p_t) - \left[\frac{(1-\alpha_1-\alpha_2)}{\alpha_5\beta}\right]\Delta p_{it}$$

Rather than the price level, we prefer to present the markup of price over costs in the long-run because it allows us to illustrate the differentiated effects of the sectoral inflation rate as well as of foreign prices on markups in each economic sector.

The above approach has been applied to four economic sectors using quarterly data over the period 1984-93: industry, agriculture, services, and commerce. The data was extracted from Argentina's National Accounts published by the Ministry of Economy, Argentina's National Institute of Statistics (INDEC), and the World Bank. The sectoral inflation rates were defined using the wholesale price and the consumer price indexes at three digit levels (see the statistical appendix for detail). The current excess demand in each economic sector has been defined as the deviation from sectoral GDP trend, while the expected value of future excess demand was calculated by the methodology used previously by Benabou and Rotemberg and Woodford.[9] Unit costs have been proxied by the average

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[8] For simplicity, the long run equilibrium excludes the feedback effect from wages to prices.

[9] The expected value of future demand, $x_t = E_t(\Sigma_{j=0}\, \delta^j y_{t+j+1})$, where a constant discount factor $\delta = 0.9$ is used for simplicity. We also used the same proxy for x_t than others. It obtained by projecting sectoral

nominal wage in each sector that were defined as gross remuneration in local currency. In some regressions the nominal interest rate (i_t) was introduced to capture the influence of financial costs on price-setting decisions. Finally, the price of foreign goods (expressed in local currency) was defined by the multilateral real exchange rate based on Argentina's most important trading partners.

We used the Two-Stage-Least-Squares (TSLS) to account for the simultaneity problem between prices and current demand (the list of instrumental variables is presented at the bottom of every Table). Overall, the results appear satisfactory as evidenced by the R^2 and the Durbin-Watson (DW) statistics (see Tables 2-5).

Industry

As expected, the industrial inflation rate is correlated positively, but not perfectly, to the variations in wages and in foreign prices (Table 2). The estimated impact associated with the nominal interest rate is also positive, suggesting that industrial firms partially absorbed their higher debt-service through higher prices. An alternative explanation is that many industrial firms are liquidity-constrained, and that an increase in interest rates forces them to generate internal funds through an increase in their prices (see Chevalier and Scharfstein (1995)).[10]

The most interesting aspect of the empirical findings is, however, the direction of the effects of changes in excess demand on the price behavior: the inflation rate responds negatively to a transitory excess demand (y_t) but positively to a permanent expected demand (x_t). These results are consistent with a collusive market behavior rather than with the customer market model, and they are robust with alternative demand indicators, including GDP growth (ΔGDP_t)

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demand on its lagged value and on (detrended) real GDP: $y_t = c_1 y_{t-1} + c_2 gdp_t$ together with an AR(1) process for real GDP: $gdp_t = c_3 gdp_{t-1}$. Hence $x_t = y_t/(1 - dc_1) + dc_2 c_3 gdp_t/(1 - \delta c_1)(1 - \delta c_3)$

[10] These authors have shown some empirical evidence in this direction for the US industrial sector.

Faced with a depressed demand during most of the 1980s, the collusive market model suggests that industrial firms maintained their profits in the short-run by increasing their prices. Some evidence of such behavior can be depicted in oligopolistic markets such as the cement, automobile, the petrochemical-plastic and the steel sectors. These groups were able to increase their prices behind the protection provided by higher tariff rates and promotion programs.[11] Similarly, under economic expansion, industrial firms reduced their prices to capture an increasing share of the expanding market. This is best evidenced by the recent experience of the Convertibility Plan when the prices in the industrial sector declined by about 10%. This collusive behavior was partially enhanced by tax and trade policies and by the interactions between the government and industrial groups. For example, the automobile sector signed an agreement with the authorities to reduce by 33 % the vehicles' prices in March 1991, in exchange of a reduction in taxes. [12]

The collusive behavior is more likely to predominate in a low competitive environment as recently found by Rotemberg and Woodford (1991) in their study on the United States. This finding also applies to the case of the Argentine industrial sector. Kosacoff and Katz (1992) found a high concentration-ratio in this sector as 2,000 firms (out of a total of 100,000) accounted for about 70 % of the value-added and 50 % of employment in the industrial sector in the late 1980s. They also found that the importance of large conglomerates increased from 20 % of total industrial production in 1973 to 27 % in 1990. However, it remains unclear if Argentine industrial firms collude explicitly through conglomerates or implicitly in the sense that there is no enforceable cartel contract, but only an implicit agreement that firms deviate from the collusive understanding will be punished. An answer would require a more detailed analysis (at the firm-level) which is clearly beyond the scope of this paper.

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[11] The constant action of pressure groups has been pointed out by many authors (see for example Diaz-Alejandro (1975)) and the best example, perhaps, of this practice was the industrial promotion program. in which oligopolistic firms (defined with market-share above 50 %) received more than half of the promoted projects over the period 1985-89 (see Azpaizu (1989) for further details).

[12] Another example is that "each year steel prices for the whole economy are decided in negotiations with the automotive, construction, and transportation industries" (Mc Kinsey, 1994)).

Table 2

Inflation equation for domestic industrial goods

	(1)	(2)	(3)
constant	**1.428**	**0.826**	**1.665**
	(1.28)	*(0.76)*	*(1.60)*
Δc	**0.634**	**0.688**	**0.516**
	(9.98)	*(13.57)*	*(6.38)*
Δp*	**0.113**	**0.127**	**-0.039**
	(1.39)	*(1.57)*	*(-0.36)*
y (a)	**-2.275**		**-1.523**
	(-1.81)		*(-1.30)*
x	**0.604**	**0.071**	**0.419**
	(2.02)	*(0.95)*	*(1.50)*
ΔGDP (a)		**-0.313**	
		(-2.03)	
$[p-\beta c-(1-\beta)p^*]_{-1}$	**-0.118**	**-0.069**	**-0.139**
	(-1.27)	*(-0.76)*	*(-1.60)*
with			
β (b)	**0.635**	**0.631**	**0.645**
	(11.16)	*(6.24)*	*(16.19)*
i			**0.004**
			(1.984)
$AdjR^2$	**0.891**	**0.893**	**0.905**
DW	**2.33**	**2.01**	**2.304**

Notes: t-statistics in parenthesis. (a) Instrumented by lagged industrial GDP (up to four quarters), and the variations in the lagged real exchange rate and the lagged nominal wage;(b)the coefficients on c_{-1} and P^*_{-1} are constrained to sum to one.

The long-term markup equation in the Argentina's industrial sector can be expressed as follows:

Equation 3

$$p_{it} - c_{it} = 0.57\,(p^*_t - p_{it}) - 3.36\,\Delta p_{it}$$

The first term captures the long-run effect of foreign prices on domestic industrial prices. An increase in foreign prices leads to some, but less than one-for-one increase in domestic prices and, thus, translates partly into an improvement in competitiveness and

partly into an increase in margins. The imperfect correlation between domestic and foreign prices reflects to some degree the existence of quotas in the automobile sector and the preferential tax treatment in Tierra del Fuego, though the Argentine government has significantly reduced the overall level of protection over the last few years.[13]

The second term reflects the non-neutrality of inflation on price-setting, the equation implies that a decrease in inflation of 1 % eventually increases markups by 3.36 % (although the long-run effect is estimated very imprecisely). While surprising, the non-neutrality of inflation on markups has been found in empirical studies in the US (Benabou (1992)) and France (Blanchard and Muet (1993)). It suggests that consumers react to more noisy prices by gathering more price quotations, forcing down markups, as the increased search pressure implies more competition in the market.[14] An alternative popular explanation for the non-neutrality of inflation is that the credibility of commitment to established parities has improved only slowly. Forward-looking Argentine price setters used to believe that Argentina was, and would remain, a high-inflation country. The increasingly aggressive commitment of the authorities to a fixed dollar parity continually surprises them. As a result, expected inflation has been falling, but at a slower pace than costs.[15]

Agriculture

The results are summarized in Table 3. Agricultural wages were proxied by the wages in the industrial sector because the former series are unavailable in Argentina. In addition, a dummy variable for the period 1987(II)-1988(I) was introduced to account for the dual exchange rate applied to agricultural products during this period.

In the short-run, the inflation rate in the agricultural sector has been affected positively and significantly by the changes in foreign prices, labor costs, and the nominal interest rate. The influence of foreign prices is explained by the high level of exports of

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[13] To account for the trade liberalization initiated since 1989, we introduced a dummy variable in the regressions. However, the estimated coefficient was not statistically different from 0.

[14] This argument, however, contradicts the usual view that sellers may use the inflationary noise as a cover behind which to increase their markups

[15] See Blanchard and Muet for a stylized model of this mechanism..

agricultural products that account for 25 % of total exports. The strong positive influence of wages is more surprising because the share of labor in the value-added of the agricultural sector is below 10 % in Argentina. This result may be however due to the strong positive correlation between wages --defined as industrial wages in the regressions-- and the costs of inputs such as transport and energy. Finally, the significant and positive impact of the nominal interest rate reflects the high indebtedness of the agricultural sector in Argentina. An increase in financial costs was partially absorbed by a reduction in margins and partially by an increase in the inflation rate.

In contrast to the results found for the industrial sector, the variations in the prices of agricultural products are not determined by domestic demand conditions --the coefficients associated with x_t and y_t appear statistically insignificant in all regressions. This result suggests indeed that price rigidities are important in this sector and that agricultural producers prefer to adjust to changes in local demand by changing quantity rather than prices. More specifically, the absence of response of agricultural prices to changes in demand can be explained by the traditional low price elasticity of agricultural products which are generally of basic necessity (Sturzenegger et al. (1990)); the existence of contracts between buyers and sellers that stabilize prices over a relatively long period of time; and the frequent government's price controls because of the high incidence of agricultural prices on the cost of living. An important characteristic of this sector is the high degree of substitutability between the local market and exports that allow producers to switch to the foreign market when the local demand is satisfied for a given price.[16]

[16] This substitutability is the most apparent through the countercyclical behavior of agricultural exports which tend to decline in period of buoyant local demand and to increase in period of recession, even when exports are adjusted for the changes in international prices. In other terms, local agricultural producers adjust to nominal shocks by changing the allocation of their production --by switching from the local to the foreign market and vice-versa-- rather than by changing their prices.

Table 3

Inflation equation for domestic agricultural goods

	(1)	(2)	(3)
constant	3.411	2.286	3.222
	(2.07)	*(1.60)*	*(2.17)*
Δc	0.634	0.642	0.486
	(9.16)	*(12.77)*	*(4.87)*
Δp*	0.203	0.230	-0.009
	(1.79)	*(2.42)*	*(-0.06)*
y (a)	3.341		
	(0.50)		
x	-3.019	0.362	
	(-0.51)	*(1.46)*	
ΔGDP		-0.401	
		(-3.10)	
$[p-\beta c-(1-\beta)p^*]_{-1}$	-0.283	-0.189	-0.267
	(-2.07)	*(-1.60)*	*(-2.16)*
with			
β (b)	0.682	0.672	0.678
	(33.49)	*(22.39)*	*(32.52)*
i			0.005
			(1.97)
Dummy	0.195	0.150	0.158
	(2.03)	(1.83)	(1.75)
$AdjR^2$	0.816	0.867	0.865
DW	2.49	2.46	2.48

Notes: t-statistics in parenthesis. (a) Instrumented by lagged industrial GDP (up to four quarters), and the variations in the lagged real exchange rate and the lagged nominal wage;(b)the coefficients on c_{-1} and P^*_{-1} are constrained to sum to one.

The long-run markup behavior in the agricultural sector is defined as follows:

Equation 4

$$p_{it} - c_{it} = 0.47\,(p^*_t - p_{it}) - 0.85\,\Delta p_{it}$$

In the long-run, markups are influenced positively, but partially, by foreign prices and negatively by the sectoral level of inflation, in lines with the results obtained earlier for the industrial sector.

Services

Although price-setting decisions in the service sector should be determined only by domestic factors ----it is a non-tradable sector, the dollarization of the Argentine economy assigns a large explanatory role to foreign prices through expectations The estimated impact of a change in foreign prices on the sectoral inflation rate appears positive in almost all the regressions (Table 4). This result suggests that suppliers in this sector establish their prices directly in foreign currency. This view is consistent with considerable anecdotal evidence in major services (tourism, hotels, entertainment, etc.) where transactions are generally conducted in US currency (see Cline (1995) or Kamin and Ericsson (1993)). The positive influence of the dollarization on the price-setting mechanism might have been reinforced by the following wealth effect. An increase in foreign prices automatically increases the value of the foreign currency held by residents --dollar-deposits accounted for about half of M2 in 1994, which in turn stimulates the demand for services and, finally, leads to an increase in the prices of this sector.

The inflation rate in services depends positively on current demand (y_t) and negatively on future demand (x_t) as predicted by the customer market model. This model suggests that, in case of an increase in demand, suppliers will raise their prices in the short-run because customers face adjustment costs in switching immediately between products. In the longer-run, these price increases have to be limited due to the increasing possibility for the customers to find other suppliers. [17] This behavior seems consistent with the evidence during the Convertibility Plan when the initial response to the boom in demand

[17] In the case of recession, the interpretation of the inflation rate behavior is not straightforward. The empirical results suggest that firms will reduce their inflation rate, in the short-run, in order to limit the loss of existing customers. But, in that equilibrium, the firms will not attract many new customers because search is expensive and few customers will learn of the price cut. Therefore, in the medium run, the inflation rate will decline less than in the short-run The idea is that demand is more elastic in upturns than in downturns. It has a long history and can be found in Pigou (1929) and Keynes (1930).

was to increase prices, followed by a gradual decline in these increases due to increasing competition.

Table 4

Inflation equation for domestic services (a)

	(1)	(2)	(3)
constant	1.077	1.709	1.417
	(1.43)	*(2.37)*	*(1.95)*
Δc	0.257	0.259	0.134
	(4.38)	*(4.74)*	*(1.52)*
Δp^*	0.197	0.164	0.055
	(2.34)	*(2.03)*	*(0.48)*
y (b)	4.229		3.776
	(2.75)		*(2.62)*
x	-0.998	-0.176	-0.875
	(-3.25)	*(-2.40)*	*(-3.00)*
ΔGDP		-0.022	
		(-0.14)	
$[p-\beta c-(1-\beta)p^*]_{-1}$	-0.087	-0.144	-0.118
	(-1.31)	*(-2.28)*	*(-1.84)*
with			
β (c)	0.518	0.612	0.566
	(3.38)	*(12.92)*	*(6.75)*
i			0.004
			(1.74)
Dummy	0.600	0.488	0.648
	(5.76)	(5.20)	(6.41)
$AdjR^2$	0.816	0.886	0.886
DW	2.49	1.80	2.16

Notes: t-statistics in parenthesis. (a) Nominal wages have been proxied by the wages of the banking sector, and the dummy variable accounts for the second hyperinflationary episode in Argentina in the last quarter of 1989; (b) Instrumented by lagged industrial GDP (up to four quarters), and the variations in the lagged real exchange rate and the lagged nominal wage;(c)the coefficients on c_{-1} and P^*_{-1} are constrained to sum to one.

In the long-run, markups are defined as follows:

Equation 5

$$p_{st} - c_{st} = 0.93(p^*_t - p_{st}) - 12.09\,\Delta p_{st}$$

The long-run results confirm the influence of foreign prices, as an increase in foreign prices is almost translated into a one-for-one increase in markups. In the long-run, the general level of inflation is non-neutral; for each 10 % decline in the quarterly inflation rate, markups in the service sector will double. This relative large effect partially arises from the slow correction error mechanism in the prices of services (captured by the coefficient a_5) and partially from the weak contribution of wages and foreign prices to the short-run dynamics.

Commerce

The short-run dynamic of inflation in commerce is influenced positively by the variations in wages as labor is the main input used in this sector (Table 5). In contrast, the variations in the prices of foreign goods do not play a significant role, but this was expected for a non-traded sector. The inflation rate is also affected by the changes in demand pressures as discussed below.

The coefficients associated with the variations in demand are consistent with the collusive market model. As discussed earlier for the industrial sector, this outcome may be the result of imperfect competition, though the evidence at hand is sketchy for this sector. The large number of retail companies suggests a high degree of competition [18], but the presence of few distributors and wholesalers may explain the collusive behavior captured by the econometric analysis. For example, in the case of diary products such as pasteurized milk and cream, two companies (Sancor and Mastellone) control about 67 % of the production and distribution. Clearly, additional work would be necessary in this area.

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[18] In 1994, the structure of the retail commerce sector was the following: 35 percent of total production by supermarkets bigger than 350 sq.m, 30 percent by supermarkets smaller than 350 sq. m., and 35 percent by small stores (source: Alpha (1994)). The recent evidence shows a strong process of concentration in this sector, in line with the market structure in industrialized countries.

Table 5

Inflation equation for commerce	(1)	(2)	(3)
Constant	5.604	1.516	4.798
	(3.64)	*(1.35)*	*(3.24)*
Δc	0.459	0.383	0.642
	(3.78)	*(2.89)*	*(3.39)*
Δp*	-0.016	0.035	0.145
	(-0.08)	*(0.18)*	*(0.67)*
y (a)	-5.270		-4.758
	(-3.58)		*(-3.73)*
x	1.100	0.013	0.987
	(3.41)	*(0.13)*	*(3.49)*
ΔGDP (a)		-0.540	
		(-1.30)	
$[p-\beta c-(1-\beta)p^*]_{-1}$	-0.302	-0.080	-0.257
	(-3.61)	*(-1.30)*	*(-3.20)*
with			
β (b)	0.964	0.787	0.953
	(32.55)	*(4.37)*	*(27.69)*
i			-0.006
			(-1.25)
$Adj R^2$	0.668	0.591	0.690
DW	2.45	2.31	2.29

Notes: t-statistics in parenthesis. (a) Instrumented by lagged industrial GDP (up to four quarters), and the variations in the lagged real exchange rate and the lagged nominal wage;(b)the coefficients on c_{-1} and P^*_{-1} are constrained to sum to one.

The long-run markup equation is the following:

Equation 6

$$p_{it} - c_{it} = 0.04\,(p^*_t - p_{it}) - 1.86\,\Delta p_{it}$$

The variation in foreign prices does not affect significantly the markups of commerce in the long-run because it is a non-tradable sector. Like in the other sectors, the

level of inflation in non-neutral on markups, but the magnitude of this effect appears relatively limited due to the strong influence of wages on prices in this sector.

3. A Summary: The Differentiated Effects of Changes in Aggregate Demand and Foreign Prices on Sectoral Prices

The econometric analysis has shown large differences in the price behavior across sectors. Basically, firms do not respond uniformly to changes in production costs, foreign prices, and demand conditions. In this section, we try to put the pieces together and to derive major policy recommendations.

The heterogeneous response of each economic sector to homogenous nominal shocks is illustrated by the effects of a variation in economic activity (as captured respectively by y_t and x_t) and a change in foreign prices (Δp^*) on the inflation rate, in both the short and long-term (Table 6). These price elasticities are derived from the estimated coefficients of the preceding section, but should be interpreted cautiously because they ignore the relationships between prices, wages, and interest rates and the eventual changes in the allocation of resources across sectors.[19] Unlike most empirical studies, these results provide insights on the price adjustment mechanism in the non-tradable sector, a particularly controversial issue. Incidentally, the effects implied by a decline in economic activity and an increase in foreign prices are quite similar to those that would emerge, respectively, with a deflation and a devaluation policy.

A variation in economic activity would spread unevenly over the prices of firms operating in industry, agriculture, service and commerce. The textbook approach is that firms reduce gradually their prices in order to eliminate excess production. This is exactly what is predicted for firms in the service sector since for each 1 % transitory decline in demand, the inflation rate will decrease by 4.4 % (although measured very imprecisely).

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[19] Although the analysis focuses on the product market, this should not be taken to imply that macroeconomic adjustment problems could not arise elsewhere in the economy, or that the labor market is unimportant. There has, however, in much at the recent literature been a tendency to model the product market rudimentary.

All firms in this sector will reduce their prices, otherwise they will lose their customers due to the low costs of switching between suppliers. However, this result does not hold for firms in the industrial and commerce sectors, at least not in the short-run. As the result of their collusive behavior, their initial response is to compensate the reduction in demand by higher prices --a 1 % transitory decline in demand will increase their inflation rate by 2.3% and 5.3 % respectively. Only over time, when the negative shock on demand is perceived as permanent, these firms will reduce their prices and, thus, adjust to the new demand conditions. Finally, the prices of the agricultural sector would not be directly affected by the changes in domestic demand for the reasons discussed in the preceding section.

Table 6: Elasticities of Sectoral Inflation Rates

	Changes in Demand		Changes in Foreign Prices	
	Transitory (y_t)	Permanent (x_t)	Short-Run (Δp^*_t)	Long-Run[a/] (Δp^*_t)
Industry	**-2.28**	**0.60**	**0.11**	**0.17**
Agriculture	**0.00***	**0.00***	**0.20**	**0.55**
Services	**4.43**	**-1.00**	**0.20**	**0.08**
Commerce	**-5.27**	**1.10**	**0.00***	**0.00***

Source: First column of Tables 2-5.

*** not statistically different from 0.**
a/ Derived from the long-run markup equation

A change in foreign prices, say an increase, would lead to higher domestic prices in most of the sectors, with the notable exception of the commerce sector. These firms will remain unaffected, at least directly, because they principally produce non-traded goods. Firms operating in tradables sectors such as industry and agriculture would increase their

prices because of lower foreign competition. Notice that a 1 % increase in foreign prices would be only absorbed in the short-term by a 0.11 % and 0.20% increase in the inflation rate of the agricultural and industrial sectors, respectively, leading to both higher international competitiveness and margins. The inflation rate in services would also increase due to indexation mechanism caused by the widespread dollarization of the Argentine economy, even though this initial increase will gradually decline through the error-correction mechanism that will bring prices closer to production costs in the long -- run.

Large divergence in the response of economic sector to nominal shocks has obvious implications on the political economy of Argentina. In this interpretation, we subscribe to the recent positive approach to government intervention (i.e., Alesina and Drazen (1992)). Policies are viewed as the result of an equilibrium solution between the desires of different economic sectors and the government, which itself is composed of different groups and individuals who seek to maximize their own gains. The impact of nominal shocks on prices affects this equilibrium as demonstrated by the following example. In case of recession, the collusive behavior of firms in industry and commerce allow them to maintain their prices and markups and, thus, to alleviate the burden of the adjustment. In contrast, individual firms in the services sector would have to reduce their prices (and margins), otherwise customers would switch to other suppliers. The first two sectors only explain 25 % of GDP, while services account for 60 % of GDP and 70 % of employment in Argentina. Therefore, if policy decisions are influenced by lobby activities, the authorities will feel pressure to satisfy the majority; that is the service sector, by attempting to reactivate the economy. Nevertheless, the industrial and commerce sectors are perhaps better organized groups (reflecting their collusive behavior) and, thus, better equipped to dialogue with the authorities.

Eliminating price rigidities is important in order to maintain political and social stability. In the case of Argentina, the collusive behavior of firms in the industrial and (retail) commerce sectors should be reduced by increasing competition in these markets. In that direction, the government should improve the enforcement of anti-trust legislation as well as promote foreign direct investment in these sectors. Equally important is to reduce

the trade barriers in the remaining protected sectors such as the automobile and electronic industries, a major factor in explaining the price behavior in these markets. Recently, the inflow of foreign investment in the automobile (e.g., Toyota and Fiat) and retail commerce sectors (e.g., Wal-Mart) has contributed to increase competition, and to some degree to the relative decline in prices observed in these sectors.

4. Concluding Remarks

There is a long debate in the economic literature on the neutrality of nominal shocks on real variables. This paper has followed the Keynesian tradition by examining the impact of monetary and exchange rate policies on the structure of relative prices in Argentina. The empirical results on Argentina are particularly interesting because they challenge the traditional assumption that the large nominal shocks that occurred in this country over the last decades have spread evenly and proportionally over the prices of all economic sector. More generally, we believe that these findings apply to other countries as well.

Although the analysis contains a certain number of limitations -- e.g., the relationships between prices and costs as well as rigidities in the labor and financial markets have to be included, the conclusions are straightforward. First, price rigidities are captured to some extent by the effects of nominal shocks on the structure of relative prices. According to the classical theory, the structure of relative prices would remain unchanged if all firms reacted with synchronized timing to exogenous nominal shocks.

Second, the magnitude and distribution of price rigidities across sectors depend on the nature of the nominal shock as evidenced below:

- Price rigidities emerge when firms facing changes in aggregate demand behave collusively and there are costs for customers to switch between suppliers. The higher is the collusive behavior, the higher is the possibility for these firms to maintain or eventually increase their prices in the case of recession. In contrast, when the costs for

customers to switch between suppliers are low, firms are obliged to adjust their prices to new demand conditions, otherwise they will lose their customers.

- Changes in foreign prices affect domestic prices depending on the degree of foreign competition and the price formation mechanism in each sector. As expected, price rigidities are minimal in tradable sectors where firms react to these changes by changing their prices almost instantaneously (although not-one-for-one). The response in non-tradable activities depends on indirect effects and whether prices are indexed to a foreign currency, which is likely to occur when transactions are conducted in a foreign currency.

Finally, price rigidities are likely to be perpetuated over time by the long term impact of nominal shocks on markups of price over costs in all sectors, which in turn affect allocation mechanisms and, thus, the real side of the economy.

These conclusions have obvious policy implications. The response of individual prices reflects to some extent the distribution of adjustment costs across sectors in case of nominal shocks. This is the most evident when, facing a recession, some sectors are able to maintain their margins through a collusive behavior, while others have to reduce them in order to retain their customers. To maintain social and political stability, the government's challenge is to minimize divergence across sectors. Increasing competition appears to be a crucial element of this strategy since monopolistic power is frequently associated with the existence of price rigidities. This seems consistent with preliminary evidence in both Argentina and the United States.

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APPENDIX 1: PRICES BY ECONOMIC SECTORS

We used the series from the Wholesale price index and the Consumer price index to to define the evolution of prices by sectors over the period 1981-93. These series have first been decomposed at three digit-level and then regrouped by economic sectors. In the case of services and commerce, the series were calculated as a weigthed arithmetic average of the selected groups.

Economic Sectors	Source	Name	Index Number
Agriculture	Wholesale Price Index	Agricultural Products	1000
Industry	Wholesale Price Index	Manufactured Products	3000
Commerce	Consumer Price Index	Food and Beverage	10000
		Clothing	10000
		Houseware	20000
		Phamarceutical goods	40000
		Entertairments	70100
		Books and newspapers	70200
		Audio and video equipment	70400
		Tobacco	90100
		Personnel Care Products	90200
		School books and equipements	80200
Services	Consumer Price Index	Health Services	50200
		Leisure Services	70500
		Education	80000
		Personnal Care	90300
		Others Services	90400
		Household Services	40600

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